

WHAT IS CLAIMED IS:

1. A dielectric layer, comprising:

a densified amorphous dielectric layer deposited on a substrate by pulsed-DC, substrate biased physical vapor deposition,

wherein the densified amorphous dielectric layer is a barrier layer.
2. The layer of claim 1, wherein the deposition is performed with a wide area target.
3. The layer of claim 1, wherein the barrier layer is also an optical layer.
4. The layer of claim 3, wherein the barrier layer includes a TiO₂ layer.
5. The layer of claim 3, wherein the barrier layer includes an Alumina/Silica layer.
6. The layer of claim 3, further including a soft-metal breath treatment.
7. The layer of claim 6, wherein the soft-metal breath treatment is an indium-tin vapor treatment.
8. The layer of claim 1, wherein the barrier layer is also an electrical layer.
9. The layer of claim 8, wherein the barrier layer includes a capacitive layer.
10. The layer of claim 9, wherein the capacitive layer is a TiO₂ layer.
11. The layer of claim 9, wherein the capacitive layer is an Alumina/silica layer.
12. The layer of claim 8, wherein the barrier layer includes a resistive layer.
13. The layer of claim 12, wherein the resistive layer is indium-tin metal or oxide.
14. The layer of claim 8, further including a soft-metal breath treatment.
15. The layer of claim 14, wherein the soft-metal breath treatment is an indium-tin vapor treatment.
16. The layer of claim 1, wherein the barrier layer includes a tribological layer.
17. The layer of claim 16, wherein the tribological layer is a TiO₂ layer.

18. The layer of claim 16, wherein the tribological layer is Alumina/silica.
19. The layer of claim 16, further including a soft-metal breath treatment.
20. The layer of claim 19, wherein the soft-metal breath treatment is an indium-tin vapor treatment.
21. The layer of claim 1, wherein the barrier layer is a biologically immune compatible layer.
22. The layer of claim 1, wherein the biologically immune compatible layer is TiO_2 .
23. The layer of claim 21, further including a soft-metal breath treatment.
24. The layer of claim 23 wherein the soft-metal breath treatment is an indium-tin vapor treatment.
25. The layer of claim 1, wherein the dielectric film is TiO_2 .
26. The layer of claim 1, wherein a target utilized to form the dielectric film has a concentration of 92% Al and 8% Si.
27. The layer of claim 1, wherein the target utilized to form the dielectric film is formed from metallic magnesium.
28. The layer of claim 1, wherein the target material comprises materials chosen from a group consisting of Mg, Ta, Ti, Al, Y, Zr, Si, Hf, Ba, Sr, Nb, and combinations thereof.
29. The layer of claim 28, wherein the target material includes a concentration of rare earth metal.
30. The layer of claim 1, wherein the target material comprises a sub-oxide of a group consisting of Mg, Ta, Ti, Al, Y, Zr, Si, Hf, Ba, Sr, Nb, and combinations thereof.
31. The layer of claim 1, further including a soft-metal breath treatment.

32. The layer of claim 31, wherein the soft-metal breath treatment is an indium-tin vapor treatment.
33. The layer of claim 1, wherein the dielectric film has a permeable defect concentration of less than about 1 per square centimeter.
34. The layer of claim 1, wherein the water vapor transmission rate is less than about 1×10^{-2} gm/m²/day.
35. The layer of claim 1, wherein the optical attenuation is less than about 0.1 dB/cm in a continuous film.
36. The layer of claim 1, wherein the barrier layer has a thickness less than about 500 nm.
37. The layer of claim 36, wherein the water vapor transmission rate is less than about 1×10^{-2} gm/m²/day.
38. The layer of claim 1, wherein the barrier layer thickness is less than about 1 micron and the water vapor transmission rate is less than about 1×10^{-2} gm/m²/day.
39. The layer of claim 1, wherein the barrier layer operates as a gate oxide for a thin film transistor.
40. A method of forming a barrier layer, comprising:
- providing a substrate;
 - depositing a highly densified, amorphous, dielectric material over the substrate in a pulsed-DC, biased, wide target physical vapor deposition process.
41. The method of claim 40, further including
- performing a soft-metal breath treatment on the substrate.
42. The method of claim 40, wherein the dielectric material is formed from a target comprising 92% Al and 8% Si.

43. The method of claim 40, wherein the dielectric material is formed from a target comprising of Titanium.

44. The method of claim 40, wherein the dielectric material is formed from a target material comprising materials chosen from a group consisting of Mg, Ta, Ti, Al, Y, Zr, Si, Hf, Ba, Sr, Nb, and combinations thereof.

45. The method of claim 41, wherein the soft-metal breath treatment is an indium/tin breath treatment.